



UNIVERSITY OF LEEDS

School of Physics and Astronomy

Health and Safety Handbook

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Preface

Distribution of this handbook

It is a legal requirement to work safely and to be familiar with the relevant health and safety information in this handbook. Research laboratories, teaching laboratories, workshops and research groups should therefore have an up-to-date copy available. A wider circulation within the school is encouraged. The handbook can be downloaded from the school safety web pages, see section ???. Bound copies of the handbook may be available from the School Safety Supervisor.

Request for comments and further inputs

Please contact the School Safety Supervisor or another member of the school safety committee with any corrections, suggestions, or further information to include in the next version of the handbook. Contributions are welcome, ideally in plain text or in LATEX sent by e-mail to the School Safety Supervisor. To have further safety information included in the school safety web site, for example specialist safety manuals to download or relevant hypertext links, please contact the School Safety Supervisor.

Acknowledgements

The text in this handbook originates from many different sources. Both present and past members of the school safety committee have contributed much of the text on specific topics. Other sections were either copied or adapted from the University of Leeds Safety Advisory Services Office Safety Manual or from the University of Leeds Safety Advisory Services web site.

Chapter 1

Safety Management

Under the Health and Safety at Work Act 1974 [?] and other health and safety legislation the school is obliged to:

- Set standards that comply with all relevant statutory requirements so that the health and safety of staff, students, visitors and the general public are not adversely affected by the activities of the school;
- Provide and maintain equipment and a working environment that are, so far as is reasonably practicable, without risks to health and safety;
- Train all staff to be aware of their own responsibilities for, and to provide information, instruction and training on, the particular hazards and risks which exist within the school.

This Handbook is a summary of the safety regulations which apply to those working in the school. It is a short document and cannot cover all aspects of safety or all of the requirements of current legislation. Its aim is to ensure that workers are aware of the major issues and to provide a source of references to those needing more detail on specific topics.

1.1 Safety Management

1.1.1 Responsibilities of the Head of School

Overall responsibility for safety lies with the Head of School as stated in the University Safety Policy. For details see appendix ?? . See also figure 1.1 on page 8.

1.1.2 Responsibilities of the Safety Committee

Day to day safety matters are delegated to the Safety Committee. The members of the committee are listed in table 1.1 on page 9. The members of the School Safety Committee and the School Safety Supervisor act as focal points for day-to-day matters. The detailed responsibilities of the School Safety Supervisor, the School Laser Safety Supervisor, the School Radiation Protection Supervisor and of the Fire Wardens as stated in the University Safety Policy are described in appendix ?? . Any health and safety issues which cannot be resolved by a supervisor or line manager should be raised

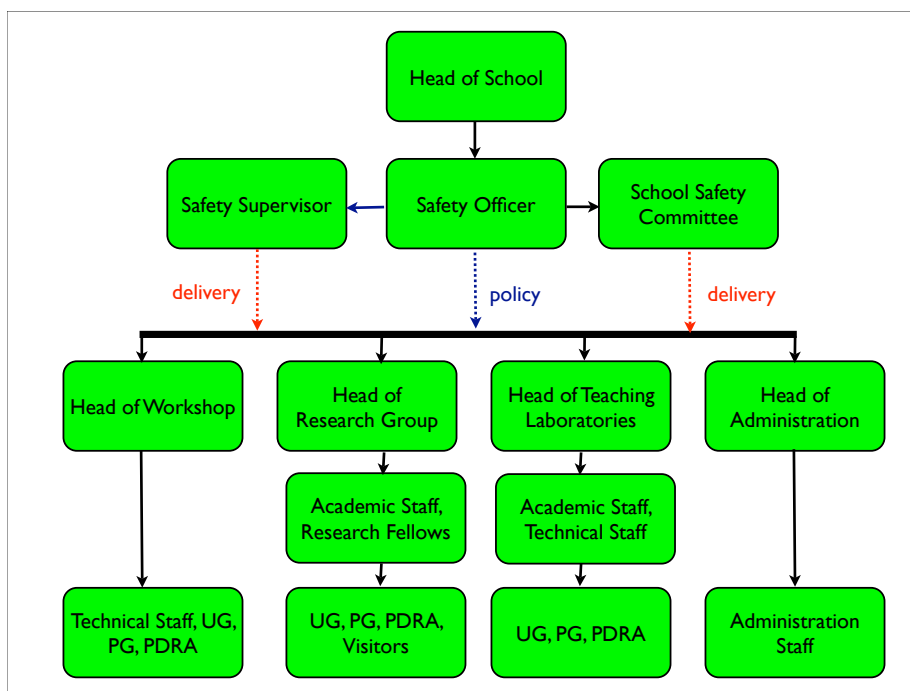


Figure 1.1: Safety responsibility

with a committee member or with the School Safety Supervisor in the first instance. The Safety Committee is responsible for making regular (at least annual) inspections of laboratories. The members of the Safety Committee have the authority to stop any work in any laboratory, workshop or elsewhere in the school should the activity or the facilities not meet safety standards.

1.1.3 Responsibilities of all Students and Staff

Those in a supervisory or managerial role have special responsibility to ensure that the safety rules and codes of practice of the School are enforced in their areas. It is important that the safety issues relating to any work carried out are discussed with a supervisor or line manager. It is essential that this happens before undertaking procedures that are not entirely familiar. All staff working in the School have the responsibility to foster best working practices and a progressive safety culture.

1.2 Safety inspections

There are safety inspections annually for each individual research group, teaching lab and office space. The inspections are carried out by members of the Safety Committee together with Union representatives. Collectively, the inspection team should have sufficient expertise to be effective in spotting potential problems. For example when inspecting a research group using lasers the laser safety supervisor should ideally be present or a member of the team should have laser safety training. The head of the

Person	Responsibility	Phone	e-mail
Dr J Rose	Chairman Safety Committee, Deputy Safety Supervisor	33889	h.j.rose@leeds.ac.uk
Mr S C Wellings	Deputy Safety Supervisor / COSHH Laser Safety Supervisor	33874	s.c.wellings@leeds.ac.uk @leeds.ac.uk
Dr M Ali		33833	phyma@leeds.ac.uk
Mr P Ogden		33832	p.a.ogden@leeds.ac.uk
Dr P J Hine	Radiation sources, First Aid Co-ordinator	33827	p.j.hine@leeds.ac.uk
Mr S Weston	Fire Safety, Safety Supervisor	33819	s.weston@leeds.ac.uk
Dr V Kendon	Environmental Co-ordinator	33858	v.kendon@leeds.ac.uk
Dr H Christenson		33879	h.k.christenson@leeds.ac.uk

Table 1.1: Health and Safety Committee members

PLACE A PDF COPY OF RISK ASSESSMENT HERE

Figure 1.2: Example of a table to record the action items identified during a safety inspection.

research group (or the equivalent for non-research spaces) takes part in the inspection. The inspection team produce an inspection report which contains a list of actions items. During the inspection the deadlines for remedial action are agreed with the head of group, to whom the report is sent promptly after the inspection. It is the responsibility of the head of group to assign a group member for each action items or to find other ways of meeting the deadline. The inspection reports are also posted on the school safety web site or available inside admin file space. The head of group reports to the School Safety Supervisor that the remedial work is complete by returning the signed inspection report. If any problems in meeting a deadline arise the head of group contacts the School Safety Supervisor to discuss which measures to take. After receiving the signed inspection report the School Safety Supervisor (or members of the safety committee) checks that the identified safety problems have been dealt with. Finally the School Safety Supervisor signs the inspection report to indicate that all action items have been completed and sends a copy of the reports to the Head of School. If there are still outstanding issues the School Safety Supervisor takes appropriate action. While the issue is being resolved the School Safety Supervisor or the safety committee may impose restrictions, shutdown some activities entirely or close down whole laboratories or rooms.

1.3 Risk assessment

1.3.1 Legal requirement for risk assessment

The Health and Safety at Work etc Act 1974 [?] introduced the concept of reasonable practicability which implies the need for employers to protect persons affected by their work and to provide a degree of control commensurate with the level of risk. The Management of Health and Safety at Work Regulations [?] take this one stage further by explicitly requiring employers to carry out a suitable and sufficient risk assessment. Health and safety risk assessment is the systematic identification of the hazards associated with an organisations work activities and premises; and the evaluation of the risks associated with those hazards: it then involves the identification of the measures necessary to control these risks. The advice in this School Safety Handbook outlines the standards to be achieved for various hazards. It also outlines the control measures which ensure that the risks arising from these hazards are adequately controlled. If however there are additional hazards or specific activities in the school which are not adequately addressed in the School Safety Handbook then the onus is on the school to develop and set standards for the hazard or activity.

1.3.2 Risk assessment procedure

The principal responsibility for risk assessment rests with the research group leaders, with the senior technician in charge of teaching laboratories, and with the heads of the school workshops.

The contact person should be able to provide further information and to keep the School Safety Supervisor informed about progress. The contact is not necessarily the person who carries out the remedial action as determined by the head of group who has ultimate responsibility. The column S indicates the Severity of a possible accident that may result from the identified problem. The columns L indicated the likelihood of an accident. The entries (L -low, M -medium, H -high) are used to decide which deadline to set. The last two columns on the right are to report that the tasks have been completed and for the School Safety Supervisor to check that all problems have been resolved satisfactorily. The group leaders have the detailed knowledge within their area of responsibility to ensure that the risk assessments are carried out, that they cover all significant risks, that the risk assessment are kept up-to-date, and that they are of a sufficiently good quality. While the overall responsibility rests with them the group leaders can delegate risk assessment tasks to competent staff in their group. Each laboratory or workshop should be assessed in a one or more risk assessment documents. Guidelines on how to carry out the risk assessment, including information on how to rank risks depending on hazard severity and likelihood of occurrence, are given in Appendix ?? on page ??.

Where the assessment of the significant risks becomes too complex, for example because there are several different workplaces or different procedures to consider, a number of individual assessment documents should be prepared. The complete risk assessment is signed by the group leader, forwarded to the School Safety Supervisor to be approved, and afterwards returned to the group. Where reasonably practicable all risk assessments should be displayed in the laboratory or workshop. Ideally the risk assessment should be displayed together with the School Safety Notice and a copy of the School Safety Handbook. If this is not practicable then all safety information for a laboratory or workshop should be collected in a file which is visible and easily available to everyone in the laboratory or workshop.

Risk assessment and safety inspections

To ensure that the risk assessment procedures are operating satisfactorily the regular safety inspections of workshops and laboratories examine the risk assessments. Both positive examples of good practice and any action items arising from problems are identified in the inspection report. Even though there are regular safety inspections, all group leaders are still responsible to ensure a complete and accurate set of risk assessments is maintained. Whenever there is a significant change, for example, if a new potentially hazardous experimental procedure is introduced, then a new or modified risk assessment is needed.^{1 2}

1.3.3 Accident Reporting

In the event of an accident, seek first aid immediately. For serious injuries, the injured party will be taken to Casualty at the LGI by ambulance after dialling 999. For moderate injuries, the injured party may be escorted to casualty on foot (if they are able) by a colleague, which may be quicker than an ambulance. They may also require first aid before leaving the department. Minor injuries (such as cuts, knocks, etc.) should be addressed to the trained first aider for that area (e.g. for a minor accident near the

¹For the purposes of this handbook the research group leaders, the senior technicians in charge of teaching laboratories, and the heads of the school workshops, are referred as group leaders with special responsibility for safety.

²Yellow, A4 size, lever-arch, with label Safety Information

Mechanical Workshop, there are trained First Aiders in the Mechanical Workshop who will be happy to assist). The accident should be reported to the School Safety Supervisor or Deputy Safety Supervisor as soon as possible and brief notes will be taken and then entered later on to the University Sentinel Accident Reporting system. If this is not possible, Beverly Robinson (in the undergraduate office) has been trained in the use of Accident Reporting. The advice from the University Radiation Protection and Safety Services is to record all Accidents, however trivial (let common sense prevail) and also for Dangerous Occurrences (near misses). The guiding rule is -if in doubt report it. [edit]

1.3.4 Compensation and Insurance

Public Liability and Employers Liability

Where the University is legally liable to meet a claim made by an injured member of staff, a student or any other injured party the University has existing insurance policies to cover such incidents.

Personal Accidents: Staff

All members of staff, paid through the University payroll, are covered for personal accident whilst on University business and whilst commuting. Death benefit is one years salary with a percentage payment for other injuries of a permanent nature. A voluntary scheme of accident insurance, at favourable rates, is available to top up the benefits by an additional £50,000. These policies are paid without prejudice to any claimant under the Employers Liability Policy.

Personal Belongings

The University cannot accept responsibility for the loss, theft or breakage of personal belongings of staff, students or others on its premises. Its insurance policy will only cover those items for the risks of fire, water and explosion. Even for these hazards, they are not covered if otherwise insured, such as under a house owners comprehensive policy. Items of value should be covered by their owners under an all-risks policy or a householders comprehensive policy with suitable extension. Note: Failure to comply with the correct safety procedures can, in some instances, invalidate your insurance cover. Further information on insurance matters may be obtained from the Financial Accounting Office.

1.3.5 First Aid

Before beginning any work the location of the nearest qualified First Aider and of the nearest first aid box should be established. A list of qualified first aid personnel, their locations and phone numbers are included in appendix C.1. Appendix C.1 also gives the location of all first aid equipment in the school. Refills for the first aid boxes are the responsibility of the research groups, teaching laboratories and workshops and supplies can be obtained from Mr B Chesworth in the Stores Office. Any use of a first aid box should be reported by completing an entry in the Accident Book. See section 1.1.6 on accident reporting. Arrangements for First Aid in the school are coordinated by Mr S Weston (phone 33819) who can give advice on becoming a First Aider, training,

and on first aid equipment. The Student Medical Practice are prepared to provide on-campus assistance in emergencies but recommend that injured personnel or students are taken directly to Leeds General Infirmary (LGI) Casualty school. The Student Medical Practice can be contacted on telephones with an outside line on 9 295 4488 or on internal telephones via the Security Office 32222 .

Chapter 2

Specific Hazards and Safety Procedures

2.1 Fire

Please ensure that you are familiar with the section Fire in the University Safety Handbook. You should know the location of your assembly point outside the building and the designated escape routes from the building. The escape route and the assembly point depend on where you are in the building. Anyone working in the School should know the location of the nearest fire extinguisher and of the nearest fire alarm point.

2.1.1 Fire Alarm procedure

Circumstances must dictate whether attacking a fire with portable fire-fighting equipment should take priority over summoning the fire service and raising the alarm. Clearly it is undesirable to allow a small fire to take hold through waiting for outside help but it can be dangerous to delay calling for assistance in dealing with any outbreak which may not be quickly extinguished by prompt action. Only use fire fighting equipment if the full extent of the fire can be ascertained and you are confident that the fire can be easily extinguished. In all other cases the alarm should be raised by breaking the nearest break glass call point. If your efforts to extinguish the fire are unsuccessful raise the alarm. Security will be alerted automatically but if there is time contact the Security Office on Ext 32222 with details (i.e. building, room number). Every case of fire must be reported to the School Safety Supervisor.

2.1.2 The Fire Alarm System and evacuation of the building

As well as manual break glass call points near to the electronic sirens there is an automatic fire alarm system utilising smoke detectors. When either is activated electronic sirens will sound throughout the School. On hearing the fire alarm siren you must leave at once and make for the official assembly points. Do not wait to be asked to leave. If at all possible make safe any potentially dangerous equipment or experiments first. Do not congregate around the exits and in particular keep the area around the building clear for emergency services to gain access and park. Do not leave the assembly area or re-enter the building until given permission to do so by the Fire Officer or Fire Wardens

even if the alarm has ceased to sound. Never use lifts after the fire alarm has sounded. The only circumstance in which people may remain in the building when the alarm is sounded is when they have been given prior notice by the Head of School or the School Safety Supervisor to disregard a fire practice alarm.

2.1.3 Fire protection equipment

- **Fire Extinguishers :** Fire extinguishers are available in all laboratories, each with a security tag. Every worker must know the position of these fire extinguishers, type and method of operation. It is too late to learn this when a fire starts! If you use a fire extinguisher or note the loss of the security tag this must also be reported to the School Safety Supervisor or a Fire Warden to obtain a prompt replacement. Remember a colleagues life may depend on it.
- **Fire Blankets :** These are provided in metal containers fastened to the wall at various points in the building. They are primarily intended for use when clothing catches fire and may be quickly removed from their containers by a downward pull on the tape attached to the blanket. Wrap the victim in the blanket and make them roll on the floor. The use (or unpacking) of a fire blanket must be reported to the School Safety Supervisor.
- **Fire Doors :** Fire resistant doors are strategically placed in corridors and at the entrance to laboratories to limit the spread of fire and smoke throughout the building. Never leave such doors wedged open. Please be vigilant to make sure they are closed at all times.

The School has appointed Fire Wardens whose main duties are to assist in the evacuation of the building in the event of fire. On these occasions they normally wear an identifying arm band. The Fire Wardens regularly check the fire protection equipment. Fire precautions and other related activities are coordinated by Mr Stuart Weston. A list of Fire Wardens is included in appendix ??.

2.2 Electrical Safety

Electricity can kill - and it cannot be seen or heard! Follow this code of behaviour:

1. All incoming New Electrical Equipment should be channelled through the School Stores, so that it is recorded on the School Register for a PX Number to be allocated, after which it must be tested for electrical safety (using a Portable Appliance Tester (PAT)). The details of the tests are then downloaded onto a database. In this way the frequency of the tests for particular electrical equipment can be controlled. There should be regular visual inspection of items particularly prone to wear or abuse e.g. flex and cable, at reasonable intervals.
2. Do not interfere with any electrical apparatus or equipment or attempt to repair it unless you are an electrician and authorised to do the work.
3. All plugs must be in good condition. Any damaged plugs or plugs which get hot when in use must be changed. Whenever possible, 3-core cable should be used to permit proper earthing of apparatus.

4. Do not change fuse ratings arbitrarily, Electricians are the right people to determine and set the fuse ratings. All 13 amp three pin plugs must be fitted with a fuse rated for the equipment concerned.
5. Keep distribution boards and similar installations clear of obstruction and water spillage at all times. Do not overload distribution boards or adapters. Heaters and Electric Kettles should always be connected directly to the wall outlet and not to a distribution board. If in doubt, contact the Electronics Workshop for advice.
6. Where extension multi-sockets are used, care must be taken to ensure the total loading does not exceed 13 amps. Extension multi-sockets longer than 2m must not be plugged into each other.
7. Do not improvise with electrical equipment, this means:
 - (a) Never jam wires into sockets with matchsticks or nails;
 - (b) Never run power tools from lighting sockets;
 - (c) Never hang flexible cables over nails, leave them where they can get damaged or wet, or frozen if liquid Nitrogen is likely to be spilled. Do not use them to lift or pull the equipment to which they are connected;
 - (d) Where possible, cables should be strapped into a neat bundle and secured.
8. Large items of metal equipment (e.g. laser tables, lathes, vacuum line frames etc.) should be separately earthed. Accidents have resulted when such apparatus has become live.
9. Report details of any ineffective or damaged electrical equipment to the Electronics Workshop Supervisor. Do not use it until it has been repaired.
10. It is illegal under workplace law to intentionally or recklessly interfere with or misuse any electrical equipment. Never override any safety interlocks.
11. The Electronics Workshop run courses in the use of the PAT tester so that groups can then carry out their own electrical safety checks using the PAT tester. This normally records the Earth bonding, Insulation resistance and load current. Mains leads should be PVC coated, colour coded Brown (live), Blue (neutral) and Green/Yellow (earth) and be of the correct current rating for the equipment concerned. Serious accidents to personnel and damage to apparatus can result from failure to observe this wiring rule. Some equipment of foreign manufacture may not comply with this colour code. In cases where foreign colour codes are used Mr Paul Ogdens should be consulted. Visitors from overseas please note that the British system of colour coding is different from that used in certain other countries. The use of private electrical equipment must be reported to Mr Paul Ogdens who will arrange for it to be tested. If any electrical equipment is disposed of the Electronics Workshop need to be informed of its test number. Further details on PAT testing are available in appendix ??

2.2.1 Keithley 2400 Source Meter incident

An incident has been reported with a Keithley 2400 Source Meter in which a resistor was placed in the front output connections of the instrument. A low voltage was selected or zero was selected but a high voltage was output at the terminals. This high voltage exceeded the working power of the resistor and it heated up rapidly and caught fire. In an attempt to stop the fire the resistor was removed from the terminals and in so doing, a finger contacted the output terminals of the instrument and an electric shock occurred.

User awareness

On the front panel the legend on the terminals indicates that there is the potential for 250V to be output under certain circumstances. The user manual on page 3-3 specifies that the maximum operating voltage is 210V. The user manual on page 3-10 displays a warning that extreme care should be taken touching the output terminals of the instrument. High voltage output terminals can take a long time to return to zero volts. There is always the potential of a high voltage output at any time the instrument is powered, so caution and respect for the instrument is required. If an incident occurs, switch the instrument off on power button or wall switch. Use only shrouded test leads and only connect components at the end of these leads well away from the instrument, so if there is a problem this does not obstruct the front panel of the instrument (Electronics workshop have constructed a tester box for safer connection to the front panel of the Keithley and this should always be used when carrying out a test of this nature). Students should be made aware of the dangers of instruments that have the potential to develop high voltages and the potential dangers of software driven instruments. The PAT test does not guarantee that you cannot get a shock from the instrument via its output terminals. User manuals should be read before operating equipment.

2.3 High Pressures

2.3.1 Pressure Vessels

Pressure vessels (operating above 1.5 bar or 22.5 psi), or when the product of pressure (in bars) and the volume in litres exceeds 250 bar litres, officially require annual inspection and certification and should only be used if they have a valid current certificate. Before ordering pressure vessels or starting to operate any pressure vessel in the School Mr Simon Wellings should be contacted.

Gas Cylinders

Cylinders must not be moved with the regulators attached. Cylinder trolleys must not be used to store cylinders. A cylinder must never be left free-standing but be securely clamped or held in a proper stand. Cylinders must be fitted with regulators appropriate to the type of gas and cylinder pressure. Oxygen cylinders, in particular, should only be used with oxygen gas regulators. Regulators must not be greased and normal PTFE tape must not be used to help seal cylinder regulator connections. Grease and normal PTFE tape (which is highly plasticised) can spontaneously combust/explode in contact with compressed oxygen. A more expensive grade of safe PTFE tape (from Manchester Valve and Fitting) can be used. Whilst this is mainly intended for use in connection

with oxygen lines, since confusion can easily occur, it is recommended as the only grade for all uses. Return faulty regulators and report leaking cylinders to Stores. Diaphragm valves have a useful life of about five years and should have either a date of issue or retest date label and should not be used after this date. It is good practice to fit cylinders of flammable gas with an appropriate flash arrestor and for some applications this is required as for example when the mixture formed downstream is inflammable or potentially explosive (e.g. hydrogen/ air-oxygen or hydrocarbon/air oxygen). For further details consult the HSE web-site <http://www.hse.gov.cdg/pdf/safusgc.pdf>

2.4 Manual Handling

The Manual Handling Regulations 1992, in principle, require generic risk assessments to be made for all lifting, carrying, moving tasks, etc. In practice this only becomes a regular problem for a few members of staff but there are obviously some jobs and some circumstances (e.g. for new or expectant mothers) where the risks are real and need to be considered very carefully. Never try to move very heavy equipment on your own. Remember that manpower can be provided at both University and School level and that lifting equipment suitable for some difficult jobs is kept by the Mechanical Workshop. The relevant section of the HSE publication Guidance on Manual Handling Regulations is useful and is reproduced in the Office Safety Manual (references [1] and [2]) or on the following web pages <http://www.leeds.ac.uk/safety/manhandle/mhlintro.htm>.

2.5 Office Safety

The University has produced detailed protocols for office safety which those working principally in an office environment need to read (reference [1]). Particularly you need to be aware of legislation relevant to the use of VDUs which specifies positioning, seating and lighting standards. Most modern computers are designed to be left permanently running, many employ a power saving mode and management systems which assume they are left on all the time. This is not true of some older equipment and the risk involved in leaving this permanently running needs to be carefully assessed. A common cause of overheating of office equipment and sometimes of fires is the obstruction of the ventilation -particularly with thoughtlessly placed sheets of paper.

2.6 Flood, gas leaks and electrical breakdown

During the working day cases of floods, gas leaks or electrical breakdown should be reported directly to Works and Services (tel. 35555) and the School Safety Supervisor should also be informed. After normal working hours University personnel are at home but on stand-by. They can be contacted through the Security office. Contact University Security Ext. 32222 and report the incident. You must give your extension number. The Security Officer will telephone the appropriate person on stand-by. In some cases it will be possible for you to talk directly to the person concerned. Otherwise the Security Officer will relay your report.

2.7 Out of Hours Working and Working Alone

Whereas the nature of research necessitates flexible working hours and can make timing of experiments difficult it is important to plan your work (or to work together with your colleges) so as to keep occasions when you are working alone to an absolute minimum. Certain hazardous operations (for example involving the use of poisonous gases or high pressure equipment) must never be undertaken when you are on your own. Laboratory work should only be carried out after 6 pm

- if it is unavoidable and absolutely necessary;
- if there is somebody within earshot who can summon help in an emergency; and
- if you have made an arrangement with the person responsible for that lab.

Generally, out of hours work is not encouraged other than sitting at a computer workstation. Before the first night of unsupervised observing with the one of the School telescopes, first contact Dr M G Hoare to discuss how to get access to the telescopes and which precautions and safety rules to follow while observing. The list of rules is posted on the telescope web site, in the telescope warm room, and paper copies of the list are given out. There are additional regulations for undergraduate project work in section 1.11.3.

2.7.1 Overnight Experiments

Minimise overnight running of experiments. If any experiment or equipment is left on overnight it is your responsibility to make sure that it is safe and fail-safe (i.e. that it will still be safe if the thermostat, electricity or water supply fails). Rubber tubing must be secured to the tap outlet, the drain and to both inlet and outlet of the water condenser using plastic ties and water flow reduced to a steady minimum to reduce the risk of flooding. Heated systems need thermal cut-offs. Flammable solvents being heated on stills are especially hazardous and a common source of serious fires. They may only be carried out in the Chemistry Laboratory (8-331) in fume cupboard number 3, which is protected by a Firetrace automatic dry powder extinguisher system. The system is also protected with a water cut-off device which switches off the power to the heater in the event the condenser water fails. The Unattended reaction sheet must be filled in, checked by Simon Wellings and posted on the outside of the lab door. As a matter of protocol, Simon alerts Security and Malcolm Dawson by e-mail, attaching the relevant COSHH form, and informing them of the date and times of operation. The experimental set up should not be left running longer than is absolutely necessary.

2.8 Teaching labs and project work

2.8.1 Laboratory safety tours

All students working in one of the teaching laboratories for the first time or starting project work are required to take part in a safety tour of the laboratory. This safety tour informs the students about the location of safety equipment, such as fire extinguishers or first aid boxes, and of the safety procedures, for example in the event of a fire. The attendance of students is recorded to make sure all students do take part.

2.8.2 Laboratory experiments

The handbooks for level 1 and 2 laboratories do include information on general laboratory safety and the general safety procedures. In addition both the University Health and Safety Handbook and the School Health and Safety Handbook are available in teaching laboratories. For undergraduate laboratory experiments which are not covered by the general safety information and the safety procedures in the handbook extra more detailed safety information is provided. This is done either by including the safety information in the description of the experiment in the laboratory handbook or by displaying a safety note at the workplace. Additional detailed information, for example COSHH assessments or rules for working with radioactive sources, should be referred to and should be attached in appendices. Note: a form for the risk assessment of undergraduate teaching experiments is included in appendix ??

2.8.3 Project work

For experimental¹ projects a safety note (see appendix F.1) is drafted by the project supervisor. The note is then discussed and signed by both the project supervisor and the project students before the start of the project work. A copy of the safety note is then either kept by the students or is displayed at the workplace. A further copy is held by Dr Jim Henderson (level 3) or Prof Peter Olmstedt (level 4). Any safety issues should first be discussed with the project supervisor. If any uncertainties remain students and staff are encouraged to contact Dr J R Henderson (level 3) or Dr P Olmsted (level 4) or the School Safety Supervisor, Simon Wellings.

2.8.4 Teaching laboratory safety management

The safety of laboratory experiments and of project work is the responsibility of the module leaders in close contact with the School Safety Supervisor. The members of the school safety committee assist in the assessment of potential risks such as lasers, radiation sources, or the use of chemicals. The school safety committee carries out regular inspections of the health and safety arrangements in teaching laboratories.

2.9 Non-ionising radiation

2.9.1 Laser safety procedures

2.9.2 What is required

Every new laser user in the school is required to register with the School Laser Safety Supervisor (Prof D A M Smith, phone 33875) and with the University Radiation Protection Service. Registrations forms are available from the School Laser Safety Supervisor. It is both the users and the research supervisors responsibility to ensure the registration is completed. Every new laser user in the school is required by the University to undergo an eye examination - they will be informed of the date and location of their eye test following registration. New laser users are also required to attend the University laser safety seminars which are held twice yearly. New users will be informed of the date and location of these courses at which the University Radiation Protection

¹ projects such as dissertations or computer simulation work in a computer cluster do not require completion of a project safety note.

Services handbook Lasers. Notes on protection against non-ionising radiation [3] will be issued and a certificate of attendance will be provided. This certificate is a requirement for researchers working in the University with lasers, class 3 or above. Every laser user in the school is required to adhere to the operational and safety procedures outlined the Universities Radiation Protection Services handbook ??.

2.9.3 School Laser Safety Supervisor

The School Laser Safety Supervisor conducts an annual laser safety inspection in the context of the risk assessment made by the laser user. The School Laser Safety Supervisor provides advice on laser safety procedures and sources of supply for laser safety equipment.

2.9.4 Procedure in case of an accident

Depending on the seriousness of the accident the priority is to obtain medical attention for the injured party. School First Aiders are identified in appendix C.1. The accident should be reported (see the section 1.1.6 on accident reporting) and the School Laser Safety Supervisor informed. The School Laser Safety Supervisor will assess the cause of the accident and will require that precautions are taken to prevent a repetition. The user will be required to assist in this follow up procedure.

2.9.5 Microwaves and UV Radiation

All persons intending to work with microwaves at high power (e.g. microwave ovens) or ultra-violet radiation must discuss their work with the Radiation Protection Supervisor of the School. Long term exposure to bright light, particularly in the ultra violet, can lead to premature ageing of the eye and cataract formation in later life.

2.10 Ionising Radiation

2.10.1 Local Rules (University of Leeds, Part 2)

It is the responsibility of all members of the School who wish to carry out experiments involving the use of ionizing radiations to be aware of:

1. the statutory regulations governing the use of ionizing radiations
2. the University regulations relating to the use of ionizing radiations
3. the School Rules governing the detailed application of the regulations in 1 and 2.

A copy of the Local Rules, Part 1, is issued to prospective ionising radiation workers by the University Radiation Protection and Safety. The School Rules are set out below and all radiation workers are given a copy of this document before they start work.

2.10.2 Registration

All members of the School (excepting undergraduates) who work with ionizing radiations, either in the form of radioactive sources or of X-ray generators, must be registered with the University Radiation Protection Service and Safety Service. Prospective

new users must first contact the School Radiation Protection Supervisor (SRPS) who will arrange registration. Short term visitors to the School who wish to use any radiation facilities should contact the SRPS before starting work in order to obtain temporary clearance/registration. If they have a dosimeter in respect of other employment they should carry it with them, if they do not have such a dosimeter then a temporary one should be obtained from the Radiation Protection and Safety Service. [edit]

2.10.3 Purchase of Radioactive Sources or Radiation Generators

Any new proposal to use or purchase a radioactive source or an X-ray generator must, in the first instance, be discussed with the SRPS. Orders for radioactive materials or sources must be countersigned by the SRPS or, in his absence, by the School Safety Supervisor, before being passed for ordering from a supplier.

2.10.4 Location of Radioactive Sources

Radioactive sources are under the control of Mrs S J Hopper. Sources may not be removed from the designated rooms, transferred from one location in the School to another or removed from the School without notifying either Mrs S J Hopper or the SRPS.

2.10.5 Return of Radioactive Sources after Use

Radioactive sources no longer needed for a particular piece of work must be returned to Mrs S J Hopper either for storage or, if applicable, disposal.

2.10.6 Dosimeters

All users of radioactive sources or of X-ray generators, including undergraduates (except users of the low power Tel-x-ometer X-ray generators), must wear, whilst such work is going on, appropriate dosimeters as provided by the University Radiation Protection and Safety Service. Dosimeters for staff and postgraduates are distributed and collected by Ms B Robinson and should normally be kept in the cupboard in room 8.237 which is provided with named hooks for that purpose. Dosimeters for undergraduates are distributed by the Teaching Laboratory Technicians.

2.10.7 Controlled Areas

Certain areas in the School (Appendix B.1) are designated as Controlled Areas. These areas may only be entered by persons who are working to an appropriate scheme of work. For the purposes of the rules a Controlled Area may be a small volume forming part of a piece of experimental equipment. Such areas will be clearly labelled and identifiable. Entering a Controlled Area does not necessarily mean entering it with the whole body.

2.10.8 Cleaning of Rooms

The only relevant rooms are room 8-237 where the Polymer X-ray generators are housed and the teaching laboratories. The cleaners come in daily to sweep the floor. No special precautions or warnings are issued since the X-ray tube heads and associated

equipment in room 8-237 are housed in 100% radiation proof enclosures and there is no radiation background in the rooms over the normal environmental background which is common to all rooms. The equipment in the teaching laboratories is switched off outside normal laboratory hours.

2.10.9 Summary of Sources of Ionising Radiation in the School

Radio nuclides

All sources are sealed and of comparatively low activity. Holdings have been allocated to the School under the Radioactive Substances Act 1993. A current list of actual sources held and their location is maintained by the School Radiation Protection Supervisor (Dr. Peter Hine) and a copy is kept by Mrs S J Hopper. At the beginning of each academic year the Radiation Protection Services audits the sources and wipes for leaks. A copy of the report is sent to the SRPS and Mrs Hopper. The closed SPUCRS registration certificate is displayed with the sources and on a notice board. Each month these sources are checked in their storage cupboard located in room 8.237 in the Research area. Whenever these sources are used in the second year teaching laboratory they are kept in a temporary, lead protected storage area. New additions to the stock of sources and any movement from the School are reported to the Radiation Protection Services when they occur. A current copy of the Registration Certificate is displayed on a School Safety Notice Board in the Small Common Room.

Machine Sources

All machine sources are X-ray Generators used for X-ray crystallography.

Research Equipment Room 8.237 Three Hiltonbrooks DG2 generators Teaching Equipment Room 8.10 Philips generator model PW 1120/00/60. Rontgengerat Leybold didactic generator 55481 capable of 1 microsievert per hour. Room 8.30 Five miniature generator/goniometers -Tel-X-Ometer

2.10.10 Regular Testing of X-ray Generators

The superstructures of the three DG2 generators in room 8-237 are all surrounded by interlocked enclosures. These are checked for radiation leakage by the SRPS or by an appointed person every six months using an appropriate monitor and the results are recorded in a book which is kept in the laboratory and the SRPS is informed of the results. Any problems are dealt with and the leakage rectified before the generators are used. The generators in the teaching laboratory -room 8-10 -do not have separate enclosures. The only devices used with these generators are Philips powder cameras. At the beginning of each term in which the equipment is to be used the generators and cameras are checked by the laboratory technician for radiation leakage. The results are recorded in a book which is kept available for inspection in the laboratory. Any problems are dealt with and the leakage rectified before the generators are used. The Tel-X-Ometer generators in room 8-30 are tested for leakage at the start of each term when they are to be used and a written record is kept of the results.

2.11 Chemical Safety

2.11.1 Chemistry Procedures

General

Much experimental research involves the use of hazardous chemicals particularly for the preparation of samples, from simple cleaning with common solvents to complex organic synthesis. The COSHH regulations (Control of Substances Hazardous to Health) require that all activities involving the use of hazardous chemicals must be assessed by the person concerned before the procedure is carried out and checked by a responsible person (see below). Most laboratories have their own local procedures. For the Chemistry Laboratory (8.331) and the MNP Chemistry Laboratory (8.312), the essential rules that everyone (including those not intending to use the lab) needs to know are:

1. Special local rules apply (read notices on the door) especially including
 - (a) Safety specs worn at all times.
 - (b) Laboratory hours are 9 am to 5 pm unless accompanied by a responsible person at all times.
2. All those intending to use the laboratory for any reason however trivial must make themselves known to Simon Wellings (8.331) and Ben Johnson (8.312) and be inducted into the correct laboratory usage before any work can commence (takes 20 minutes).
3. All chemicals must be left in a clean and safe state and be clearly and correctly labelled: What, Who, When, Hazard. The labs are communal facilities and good housekeeping is to be observed at all times.

2.11.2 COSHH

The essential purpose of the COSHH regulations (Control of Substances Hazardous to Health) is (i) to know the hazard of the chemicals involved (both initial and reaction products) and (ii) to minimize the risk of people being exposed to that hazard. The COSHH regulations require that all experiments etc. involving the use of chemicals must be assessed by the person concerned according to hazard and risk before the procedure is carried out. Normally this involves filling in a COSHH form which can be downloaded from the School of Physics website (under Safety) and filled in electronically. It is then scrutinized, checked and the experimenter cross-examined about their procedure by a responsible person familiar with COSHH and who then signs the form. (At the time of writing, COSHH authorisers are Simon Wellings and Hugo Christenson). The signed COSHH form must be clearly displayed adjacent to the experiment being undertaken (red file near door for the Chemistry Lab). It should be clear, concise and readable by anyone. In the event of an accident etc., the COSHH form provides information for any rescuer of the hazard and risk of the experiment. The COSHH form contains a number of sections: Personnel involved: Workplace: Laboratory No etc. Brief description of experiment: it is useful to include here the amounts of the substances involved. Substances involved: Clear and precise name; Hazards identified: simple readable descriptions, e.g. corrosive, flammable, irritant etc. Sources of information: All chemical suppliers are required to provide safety sheets on the chemicals

they supply. This is usually too much information, provided to cover the supplier's back and is not always very helpful. Other information is available in suppliers catalogues and in the library. Precautions to be taken: a) under normal conditions (storage, handling, etc) e.g. wear specs, gloves, handle in fume cupboard etc. b) in an emergency: e.g. how to deal with spillage. Procedure for disposal of waste material: when the experiment is complete how is the waste to be disposed of. If it cant be thrown away or flushed down the sink, it can be disposed of formally via the waste management procedure.

2.11.3 Advice on how to assess risk

The COSHH forms and advice on the assessment of risk may be obtained from Simon Wellings who also has the relevant literature. Dr Brian Singleton, the University Safety Officer, and the School of Chemistry could also be approached concerning the implementation of COSHH. If the substances involved are particularly hazardous then the assessor should seek sustained and professional advice, possibly from several sources. It maybe necessary to undertake the experiment in specially controlled premises outside the School of Physics.

2.11.4 Waste Disposal

Only certain chemicals can be thrown in the bin or poured down the drain. The rest need to be disposed through Simon Wellings via the University Safety Office in a controlled and specified manner. Simon needs to be informed of what the material is, its likely hazard, the quantity, whose it is (or contact name), the origin (radioactive or hazardous materials must be negotiated in advance) and where it is presently located. Materials left for waste disposal must not be left in a hazardous state, and must be clearly labelled what, hazard, who. Special sites are allocated in the Chemistry Lab, Chemistry Ops room, Pet. spirit store for waste awaiting disposal.

Appendix A

Chemistry Laboratories

The Chemistry Laboratory (8.331) and the MNP Chemistry Laboratory (8.312), have over 40 combined registered users - physicists doing chemistry -from simple sample cleaning to complex organic synthesis. It is essential that all users are aware of what they and other users are doing. The rules and procedures of the Laboratory are contained in the Handbook of Current Practices held in the chemistry laboratory (rooms 8.331 and 8.312). Users particularly new users must familiarize themselves with the local requirements and procedures outlined in this handbook and new users initiated into correct usage. The Laboratories are run by Simon Wellings and Ben Johnson. They are responsible for the day-to-day running of the laboratories and are empowered to ensure that users follow the correct procedures. Regular laboratory users may be required to undertake additional general laboratory duties.

A.1 Undergraduate Physicists doing Chemistry

Section 3 of the Health and Safety at Work Act covers students in all aspects. Any incident where a student is likely to be harmed is covered by the full criminal provisions of the HSWA and as such a duty is placed on the University (and staff) to ensure so far as is reasonably practicable that no harm occurs to students in its care. The HSE prosecutions database identifies many colleges and universities that have been prosecuted in relation to the absence of risk assessments or ones that are insufficient or inadequate. Regulation 12 of the University of Leeds Safety policy says that postgraduates in all likelihood have more experience than our undergraduates so stricter controls should apply for undergraduates. Obviously all of the above is open to interpretation to some degree so there are no hard and fast rules. But a line must be drawn somewhere in order to differentiate between undergraduate students (limited or no chemical experience) and postgraduate students who may have some chemical experience and may be familiar with the system of operation of the Chemistry labs and the department as a whole. Anything other than the most benign chemicals are unsuitable for our undergraduates. In terms of undergraduate physicists working in a Chemistry lab, substances that have the following characteristics should not be used:- Very Toxic by inhalation, ingestion or skin contact Severely Corrosive Highly Flammable Carcinogenic or suspected cancer-causing agents Cause sensitization by inhalation, ingestion or skin contact Explosive or potentially explosive Risk of causing serious damage to eyes Known teratogens or mutagens [edit]

A.2 Fume cupboards

Introduction In the laboratory, fume cupboards are a significant means of controlling exposure to hazardous substances, and the main type of local exhaust ventilation (LEV) used under the COSHH Regulations. By providing partial containment, they may provide protection for both users and co-workers from the hazardous effects of gases, vapours, aerosols and particulates.

Types of fume cupboard

- a Ducted fume cupboards This is by far the most common type of fume cupboard that functions by drawing laboratory air into the fume cupboard, thus containing and diluting the contents before discharging them to the environment, usually without filtration three metres above roof level. New installations must comply with the current British Standard, presently BS 7258:1994: Laboratory Fume Cupboards; and also with the University's own standards and specifications for fume cupboards. In order to ensure compliance with these standards and to identify any other relevant issues (e.g. planning concerns or potential conflicts with other projects), new fume cupboard installations must have the approval of the University Safety Office and the University Estate's Office. Ducted fume cupboards with face velocities of at least 0.5 m.s⁻¹ and no greater than 0.75 m.s⁻¹ are suitable for most applications, though consideration may need to be given to design and to the materials of construction. For instance, where perchlorates are used, then there must be no wood or other absorbent surfaces present; water wash-down facilities may need to be provided in the ductwork. Hydrofluoric acid and perchloric acid may not be used in the School of Physics and Astronomy.
- b Recirculatory filtration fume cupboards These may appear superficially attractive as alternatives to ducted fume cupboards, largely because of their significantly lower initial costs. They may also be considered where the installation of ductwork for conventional fume cupboards is impossible, or where insufficient make-up air is available to accommodate ducted fume cupboards. They operate by drawing air into the fume cupboard and exhausting it through a set of filters (usually some type of activated charcoal) back into the laboratory. Recirculatory filtration fume cupboards are not generally suitable for use with hazardous materials and should only be used for the control of nuisance odours, for small quantities of solvents etc. The University Safety Office should be consulted whenever their use with hazardous materials is proposed. They are suitable for some low risk work (e.g. dispensing small quantities of solvents, weighing hazardous chemicals), but they are not a substitute for ducted fume cupboards. The average face velocity should be between 0.3 m.s⁻¹ and 0.5 m.s⁻¹. In particular, they are not suitable for
 - (a) work with carcinogens or suspected carcinogens
 - (b) work with substances not effectively trapped by the filter(s)
 - (c) work with gases or vapours which are odourless, or which have odours detectable only at concentrations greater than the Occupational Exposure Standard
 - (d) work involving large quantities of substance (e.g. boiling off solvents) item use in poorly ventilated laboratories. A risk assessment is essential before

recirculatory filtration fume cupboards may be used. They are not suitable for use in situations where use cannot be effectively controlled, e.g. where multiple users frequently change procedures or where inexperienced workers operate.

A.2.1 Maintenance and testing

Carl Probert of Zurich Insurance carries out annual measurements of the face velocities of ducted fume cupboards, but the head of department is responsible for ensuring that these tests are performed on all the relevant installations. The head of department is responsible for ensuring that the Surveyor's information is up to date, so arrangements must be made to ensure that his office is notified of new ducted fume cupboard installations. These tests ensure that the department complies with the requirement of the COSHH Regulations for annual testing of LEV systems.

1. Fume cupboards must be carefully situated to avoid disturbance from draughts. BS 7258: Part 2: 1994 contains detailed recommendations on siting, including diagrams showing the setting-out distances from walls, doors, other fume cupboards, benching and circulation space. New installations must comply with this standard.
2. Fume-generating apparatus should be placed at least 150mm behind the sash to ensure proper entrainment of fumes; but it should not be so far back that the user has to lean into the fume cupboard. If the use of large items or screens is unavoidable, raising them about 50mm on blocks so that the air can flow underneath will considerably improve airflow.
3. The back baffle should be kept clear of obstructions (e.g. bottles, equipment, or tissues) which could obstruct the airflow.
4. The sash should be kept closed as much as possible in order to maximise containment. In any event, during the experiment it should not be raised above the position at which the face velocity was measured (indicated by a label affixed to the fume cupboard). Before raising the sash at the end of an experiment, the fan should be allowed to run for a while to clear any fumes.
5. Fume cupboards are working areas, so those used for experimental work should not also be used for the storage of chemicals or apparatus. Besides the effect on airflow described above, there is the possibility that a minor incident could involve these stored materials and escalate into a more serious one.
6. Care should be taken in disposing of chemical wastes via fume cupboard sinks. Their drains connect with the normal building drains and nothing unsuitable for disposal via ordinary laboratory sinks may be put down fume cupboard sinks.
7. Particular care should be taken in the event of spillages inside fume cupboards. If the material spilt is unsuitable for drain disposal (as defined in (f) above), then it must not be simply washed down the fume cupboard sink.

A.2.2 Other considerations

Note that neither type of fume cupboard is suitable for protection against microbiological hazards, where microbiological safety cabinets must be used. Where protection

must be provided against both chemical and microbiological hazards, then advice must be obtained from the University Safety Office before work commences.

A.3 Implementation of COSHH in the Chemistry Lab

In both Chemistry Labs, COSHH forms are not kept adjacent to the experiment in progress where pieces of paper could constitute a fire risk! Instead the COSHH forms referring to experiments currently in progress are to be kept in the marked red file clearly displayed near the laboratory door. On the back of the lab COSHH form, the user should indicate the proposed dates of the experiment, the fume cupboard number and sign. When the experiment is completed the COSHH form should be transferred from the red file to the black file which contains all the archived COSHH Assessment forms.

Appendix B

Radiation safety

B.1 Radiation Protection Supervisor

The School Radiation Protection Supervisors are: Dr P J Hine, EXT: 33834 (Radiation Sources and X-rays) In his absence Dr Mannan Ali should be consulted on EXT. 33833.

B.2 Controlled areas

The following areas in the School are designated as controlled areas, access to which is restricted to workers operating under a written system of work. Most of the controlled areas are regions of space in the vicinity of X-ray Generators and are not to be considered as controlled areas when the generators are switched off or if the high voltage supply to the appropriate X-ray tube is clearly off.

Room 8.237 -Polymer X-ray Laboratory The interiors of each of the three enclosures mounted on the X-ray generators. These enclosures contain the X-ray tube, tube shield and associated equipment and the doors are interlocked with the generator and shutter controller. Rooms 8.10, 8.30 -First and Second Year Laboratory 1. The interiors of the Debye-Scherrer Powder Cameras used with the X-ray generator in the Second Year Laboratory (when they are mounted on the appropriate tube shields and the X-rays are on). 2. The interiors of the clear Perspex housing which serve as safety shields for the Tel-x-ometer X-ray generators in the First Year Laboratory. When the mains supply to these units is interrupted the interior of the enclosure is no longer a Controlled Area.

B.3 Rule for undergraduate work with ionizing radiation

For the attention of undergraduate students carrying out experiments with ionising radiation All workers with ionising radiations have the obligation:- 1. to be aware of the hazards associated with such radiation 2. to follow rigorously any procedures and practices specified in the manuscript for the conduct of a particular experiment If you have been given a personal dosimeter you must keep this with you at all times whilst performing the experiment. When you leave the laboratory, except for a short period or over lunch, you should return the dosimeter to the laboratory technician for safe

keeping. If you lose the dosimeter the University Radiation Protection and Safety Service will expect you to pay for it ! Accompanying the experiment which you have been given to perform you will find listed certain procedures which have been devised for the safe handling of radio nuclides or for the safe operation of machine sources of radiation. You **MUST NOT** deviate from these procedures. If any problem arises in connection with the procedures you **MUST** consult a demonstrator or the laboratory technician before proceeding.

B.3.1 Rules for X-ray generators in room 8-237

For the attention of users of the Polymer X-ray generators in room 8-237. New users and anybody who is unfamiliar with a particular piece of equipment or technique involving use of one of the X-ray generators must consult one of the two persons named below in order to obtain appropriate instruction. Second hand instruction is potentially hazardous and must not be sought. Personal dosimeters should be carried at all times when using the equipment and should be left in the dosimeter cabinet when you leave the laboratory. The enclosures on the X-ray generators are interlocked to prevent access to the beam. No attempt should be made to defeat these interlocks at any time. If any problems arise which require access to the X-ray beam or if the equipment malfunctions or if instruction is required Dr Mannan Ali Ext. 33833, should be approached:

B.4 Work inside interlocked enclosures

General Protocol for working inside the interlocked enclosures mounted on the X-ray generators in Room 8-237, Personnel: These procedures may only be carried out by Dr M Ali. Appropriate personal dosimeters must always be worn during these operations.

1. Before commencing work possible hazards should first be considered. If there is any doubt then one of the above persons should be consulted at an early stage.
2. Use the override key to disable the interlocks and warn other persons in the room that you are doing so.
3. Install as much temporary shielding as you can around the beam in the area in which you are working.
4. Switch on the generator at minimum power and open the shutter.
5. Check the radiation field in the area where your hands will be. If the radiation is significantly above general background close the shutter and check/increase/reposition the temporary shielding. Open the shutter again and check the radiation field.
6. If the radiation field is now satisfactory increase the beam power to the working power which should be the minimum consistent with being able to carry out the work.
7. Check the radiation field again. If it is satisfactory proceed with the work. If it is not satisfactory rearrange the temporary shielding until it is.
8. Remove the override key to a safe place as soon as the procedure is completed.

B.5 Protocol for diffractometers adjustment

Protocol for making adjustments to one of the diffractometers on generator C in room 8-237 when the other diffractometer is in use Personnel: All radiation workers Normally the diffractometers are used with all of the interlocked doors closed. It is permissible, however, to make adjustments to the superstructures on one of the diffractometers whilst the other is in use. Care should be taken to avoid radiation exposure in these circumstances.

1. Appropriate personal dosimeters must always be worn during

this operation. 2. Make sure that the shutter on the equipment you are working on is clearly closed. 3. Open the appropriate interlocked door. 4. Mount a freestanding shield immediately in front of the beam exit aperture. 5. Check, using the minimonitor, the radiation field at all points where you will put your hands inside the half of the enclosure in which you are working. 6. If the radiation level is significantly higher than background level either, (a) Consult SRPS or Dr M Ali, or (b) Wait until the other diffractometer is not in use and proceed with the generator switched off. 7. If the radiation is only slightly above background levels outside the enclosure you can proceed. 8. if you can proceed, carry out any operations as swiftly as possible. 9. When you have finished make a positive check that the shutter is still closed before you remove any temporary shielding. 10. Close the interlocked door.

B.6 Protocol for the Wide Angle Camera

Protocol for the Alignment of the Wide Angle Camera on Generator B in Room 8-237 Personnel: These procedures may only be carried out by Dr M Ali. 1. Appropriate personal dosimeters must always be worn during this operation. 2. Use the override key to disable the interlocks and warn other persons in the room that you are doing so. 3. Switch on the generator at minimum power and open the shutter. 4. Check the radiation field in the area where your hands will be. If the radiation is significantly above general background, place temporary shielding in position to reduce it. 5. Mount a mirror behind the fluorescent screen so that the rear of the screen can be seen clearly from outside the enclosure. 6. Using just sufficient beam power to observe the beam spot observe the spot on the screen and adjust the camera mount using the two positioning screws on the tube shield mounting block. to maximise the beam intensity. Be very careful not to move your hand towards the film holder. Keep it as far as possible from the collimator exit in order to prevent inadvertent exposure. If any movement of the camera other than a slight realignment is required switch off the generator and check the whole assembly for correct mechanical alignment. 7. Remove the override key to a safe place as soon as the procedure is completed. [edit]

B.7 Protocol for the Pole Figure Goniometer

Protocol for the Alignment of the Pole Figure Goniometer on Generator B in Room 8-237 Personnel: These procedures may only be carried out by Dr M Ali. 1. Appropriate personal dosimeters must always be worn during this operation. 2. Use the override key to disable the interlocks and warn other persons in the room that you are doing so. 3. Before switching on the generator mount a fluorescent screen in the sample holder position. 4. Switch on the generator at minimum power and open the shutter. 5. Check the radiation field in the area where your hands will be. If the radiation is significantly above general background, place temporary shielding in position to reduce it. 6. Using just sufficient beam power to observe the beam spot watch the spot on the screen and adjust the tube shield position using the two socket head adjusting screws on the base of the tube shield mounting column to maximise the beam intensity. Be very careful only to position your hands in the vicinity of the adjusting screws and do not lean into the cabinet. If any adjustment other than a slight realignment is required switch off the generator and check the whole assembly for correct mechanical alignment. 7. Remove the override key to a safe place as soon as the procedure is completed. N.B. A plastic

divider panel should always be positioned between Airedale and Wharfedale. Interlock key must not be on display M.Ali to keep it in a safe place. Red light to be positioned centrally at back. If someone wants to use Airedale at same time as someone using Wharfedale, new protocol to be set up by M.Ali because gap at bottom of Airedale enclosure previously had flat plate extending out so that only alignment wheel could be reached. The way it is arranged at the moment, it is possible for someone using Airedale to absent-mindedly reach right over to Wharfedale beam. In this instance, the plate should be re-installed to make this occurrence impossible (unless tampering takes place). A useful way of thinking about the safety of this room is to imagine what a person on the street could do to themselves if they came into the room with malicious intent and placed their hand in the enclosures without tampering with them (hopefully a rare occurrence!). If there is little chance of them being exposed to radiation without tampering with the equipment, then we have done enough from a safety point of view.

Appendix C

First Aid

C.1 First Aiders and equipment

First aid training and provision of first aid equipment in the School is coordinated by Mr. Stuart Weston.

C.1.1 Qualified First Aiders in the School

Name Location Phone e-mail Dr Stella Bradbury 9.57 33903 s.m.bradbury@leeds.ac.uk
Mr Mansukh Patel 8.307 33831 m.patel@leeds.ac.uk Mr Andrew R Price 8.330 33832
a.r.price@leeds.ac.uk Ms Bev Robinson 8.51b 33860 b.a.robinson@leeds.ac.uk Ms
Sally Bradley 9.308 33811 s.a.bradley@leeds.ac.uk Mr Stuart Weston 8.340 3819 s.weston@leeds

C.1.2 First aid equipment

First Aid boxes are located in the following places:-

Room No Room Name Box maintained by 8.10i 2nd/3rd Year Laboratory S Hopper
8.30 First Year Laboratory A Beddows 8.37 Molecular Nanoscale Physics B Johnson
9.64 High Energy Astrophysics S Bradbury 8.215 Complex Fluids Laboratory D Adolf
8.330 Electronics Workshop A Price 8.331 Polymer Chemistry Lab S C Wellings 8.332
Teaching Workshop S Weston 8.340 Main Mechanical Workshop S Weston 8.340
Stores Office B Chesworth 8.413a Cryogenics Laboratory J Turton 8.49 Post Room
B Robinson

Appendix D

Fire safety

D.1 Fire Wardens

D.1.1 Fire Wardens in the School

The work of the Fire Wardens in the School is coordinated by Dr R A Duckett (R.A.Duckett@leeds.ac.uk, phone 33815)

Person Room No Comment Mrs S J Hopper 8.10, 8.30 during level 2 laboratory times only Dr P Hine 8.10, 8.30 during level 3 and 4 laboratory times only Mr B Chesworth Physics Store Mr M J Walker 8.202 to 8.217, 8.263 and 8.313, 8.301 to 8.311, 8.313 Mr M Patel 8.312, 8.314 to 8.335 Mr J Turton 8.401 to 8.412 Mrs G Bowles 9.301 to 9.321 Polymer research offices Mrs H Clancy 9.301 to 9.321 Polymer research offices

Mr S Weston 8.340, 8.430, 8.431 Mr S C Wellings (to be trained in course B) 8.331, 8.312, 8.215 to 8.242 Mr L Harris 8.340, 8.430, 8.431 Dr J Knapp Astrophysics Offices Ms Beverley Robinson 8.51 and 8.52 Matt Hill 8.422 (Experimental QI lab), 8.421 (to be trained in A and B courses)

Appendix E

PAT test guidelines

The School has 4 testers: 2 x Seaward PATS 1000 2 x Seaward Europa Delicate Electronics and IT equipment must only be tested with Seaward Europa. Removable Mains leads must be labelled with appliance number of equipment to which they are attached and must not be transferred to other equipment unless the new combination is then PAT tested as an assembly. The mains leads must then be re-labelled. Carrying out the procedure reduces PAT test records by 50% Currently all new equipment is PAT tested upon arrival. This is mainly to place the item on the school inventory and safety check database. Testing periods will vary with usage -light static usage may add a year to test period whereas heavy portable usage may reduce the test period. Average use test periods are as in table below.

Equipment Type	Test Type	Movement	Test frequency
IT equipment with exposed metalwork	IT-1	Static	3 years
IT equipment with exposed metalwork	IT-1	Occasional	2 years
IT equipment no exposed metalwork	IT-2	Static	3 years
IT equipment no exposed metalwork	IT-2	Portable	2 years
Power supplies, heaters etc. exposed metalwork	Power-1	Static	2 years
Power supplies, heaters etc. exposed metalwork	Power-1	Portable	1 year
Power supplies, heaters etc. no exposed metalwork	Power-2	Static	2 years
Power supplies, heaters etc. no exposed metalwork	Power-2	Portable	2 years
Vacuum Cleaners etc. exposed metal	Domestic-1	Often	1 year
Vacuum Cleaners etc. no metal	Domestic-2	Often	1 year
Refrigerators etc. exposed metal	Domestic-1	Static	3 years
Refrigerators etc. no metal	Domestic-2	Static	3 years
Distribution boards, extensions etc. Power-1	Static	2 years	
Distribution boards, extensions etc. Power-1	Portable	1 year	

In cases where equipment has a zero or very low failure rate or is very rarely used the testers are encouraged to further extend the test period provided they consult with the electronics workshop on returning test results. All equipment found to be faulty must not be used until repaired by workshop staff. Report any faults to electronics workshop. Note: Use the Europa model tester wherever possible as details of all aspects of test are recorded (visual, fuse value and all safety checks).

Appendix F

Guidelines for Risk assessment

The Health and Safety at Work Act requires that employers make a suitable and sufficient assessment of the risks to the health and safety of their employees and non-employees affected by their work. While the requirement to do risk assessments stems from the law, the underlying objective of this is to ensure that risks arising from work activities are controlled and that as a consequence of this no one engaged on work activities gets hurt or becomes ill.

F.1 Definitions

Hazard means anything that can, or has a potential to cause harm (e.g. chemicals, electricity, machinery, etc) Risk is the chance that someone will be harmed by the hazard. How to assess the risks in your laboratory/area. Step 1. Identify the hazards Step 2. Determine the people at risk Step 3. Evaluate the risks and decide whether existing precautions are adequate Step 4. Record the findings Step 5. Review the assessment and revise if necessary

F.2 Risk Assessment: Risk Ranking

The Health and Safety Executive use the simple equation: $\text{RISK RANKING} = \text{HAZARD SEVERITY} \times \text{LIKELIHOOD OF OCCURRENCE}$ Both the hazard severity and the likelihood of occurrence are categorised, or assessed, on the basis of a 3 point scale. For each category outline guidelines are given to define that category. For Hazard Severity, (i.e. potential for loss), the three categories are: 3 = HIGH Loss of life / permanent disability / Major injury; Extensive loss of plant or building infrastructure; Prohibition notice served by HSE / Prosecution 2 = MEDIUM Serious Injury or Illness / Temporary disability; Some damage to plant, equipment; Improvement Notice served by HSE. 1 = LOW Minor/ non-disabling injury or illness; Minor disruption to plant, equipment For Likelihood of Occurrence (i.e. probability that loss or harm will result from hazard) the three categories are also: 3 = HIGH - once or several times per day/ or per activity 2 = MEDIUM once or several times per month/ or per activity 1 = LOW once or a few times per year/ or over lifetime of project The product of the two values is used as the basis to determine the Risk Ranking for each item. As a rough guide, a HIGH Hazard Severity, a HIGH Likelihood of Occurrence or a HIGH RISK RANK-

ING is undesirable and effort should be made to reduce these as far as is reasonably practicable.

F.3 Risk Ranking Matrix

As can be seen from Figure 1 below, if the product of the hazard severity and likelihood of occurrence is 1 or 2, then the item being assessed is categorised as LOW RISK. Similarly if the score is 3 or 4 then the risk category is MEDIUM while scores of 6 or 9 signify a HIGH RISK category. RISK RANKING MATRIX[RISK = HAZARD SCORE X LIKELIHOOD SCORE] HAZARD SEVERITY SCORE 3 3 MED 6 HIGH 9 HIGH 2 2 LOW 4 MED 6 HIGH 1 1 LOW 2 LOW 3 MED 1 2 3 LIKELIHOOD OF OCCURRENCE SCORE Figure 1: Risk Ranking Matrix Professional judgement is required to categorise items which represent a breach of a specific statutory provision. Indeed such breaches are difficult to categorise in terms of hazard severity and likelihood of occurrence and the assessors have to decide on whether a specific breach represents a significant issue of non-compliance, in particular whether it would lead to internal or external enforcement action, and from this consideration, decide on whether risk is HIGH, MEDIUM or LOW. This is why it is important for the assessor(s) to have an understanding of the significance of any statutory breach which might arise from an activity. If the assessor is uncertain as to the significance of any breach then he/she can discuss this with the School Safety Supervisor, or other competent person, before signing the risk assessment.

F.4 Hierarchy of Risk Control

Where an aspect of the activity is ranked as HIGH RISK then the assessor/s should consider whether they have done all that is reasonably practicable to reduce risk taking into account the following risk control hierarchy namely: - avoidance /elimination (of risks) e.g. contracting out to specialists with appropriate facilities - substitution e.g. using a less hazardous substance or better guarded machine or again subcontracting a dangerous activity - controlling risks at source reviewing engineering controls - safe systems of work reviewing system of work for activity - use of personal protective equipment (PPE) as a last resort to consider whether PPE, as a complementary aspect to the above, could help to reduce risk. e.g. fume cupboard for expelling noxious vapours Similarly when an aspect of the activity is ranked as MEDIUM RISK then the research/assessment team should again consider whether risks could be reduced further by going through the above risk control hierarchy. There is no need to do the above for LOW RISK issues but there is still an obligation to reduce risks to the lowest level reasonably practicable.

F.5 Documenting the Risk Assessment

How to use the Physics and Astronomy Risk Assessment Form Download from

S:\ Safety\ Riskasst.doc

Sheet 1 a. LOCATION: enter details of Building, Room No. and Name of laboratory or workshop b. RISK ASSESSMENT: Print your name in Block capitals and

date and sign. c. APPROVED BY: Group Head and Safety Supervisor will scrutinise and sign the form after you have completed it. d. VALID UNTIL: latest date to be entered by Safety Supervisor e. REFERENCES: Write the title of your risk assessment [edit] Sheet 2 f. DESCRIPTION OF ACTIVITY: Write the title of your risk assessment g. RISK CONTROL MEASURES: List what you will do to reduce the risk, according to the Hierarchy of Risk Control h. HAZARD POTENTIAL: enter severity LOW, MEDIUM OR HIGH i. LIKELIHOOD OF OCCURRENCE: enter LOW, MEDIUM OR HIGH j. COMMENTS: enter product (h x i) the RISK RANKING and any other comments [edit] Communication of the risk assessment : Staff and student involvement

The risk assessment proforma and any other relevant information e.g. Safe Operating Procedures, Method Statements operators manuals etc. must be communicated to all persons involved with the work. Therefore on an additional sheet those engaged on the activity will be required to sign up to the fact that they have had the activity and risks associated with that activity explained to them, and that they have read and understood the risk assessment. Copies of the risk assessment and other documentation such as method statements should be displayed next to fixed equipment/processes or stored in the immediate vicinity so that it is available for consultation or for inspection.

Risk Assessment Forms

F.6 Undergraduate project safety

At the start of any undergraduate project work a project safety note should be drafted by the supervisor and is then discussed with the project students. The project safety note includes: Module code and module title: Project title: Project supervisor(s): Project student(s): Before start of project: Each student should consult the School Safety Handbook and know where to find copies of the handbook. A laboratory safety tour of all relevant laboratory areas takes place. The safety risks and the safety procedures for the project are: Manual handling: Electrical hazards: Chemical substances: Lasers or ionizing radiation: Other risks and procedures: Arrangements for working unsupervised, alone, or out-of-hours: The safety risks and relevant safety procedures for the project have been discussed between supervisor(s) and project student(s). All safety questions arising have been answered. The information in this safety form is complete and correct. Any safety actions required before the start of the project work have been taken. Signature(s) of project supervisor(s), date: Signature(s) of project student(s), date: Project students are encouraged to immediately contact Dr J Henderson (level 3 projects) or Dr P Olmsted (level 4 projects) or the School Safety Supervisor Mr S C Wellings, about any safety concerns that still remain after discussion with the project supervisor.

F.7 Risk assessment procedure

Risk assessment should be carried out using a separate form for each research laboratory, teaching laboratory, or workshop. For assessment that are too complex too record a single page form separate risk assessments should be carried out for example for each workplace or each procedure. More detailed relevant information, such as COSHH forms, laser safety forms, or operating manuals, should either be attached or a reference be given which clearly indicates where to find the information. The risk assessment should consider the point below and, in a concise form state significant po-

tential hazards and the measures taken to minimize the risks. S = severity (1 = low, 2 = medium, 3 = high), L = likelihood (1 = low, 2 = medium, 3 = high), R = risk (1 = low, 2 = medium, 3 = high), Point to consider Description and measures taken S L R Electrical hazards Any electrical hazard beyond the use of mains voltage to power equipment, which is covered by the PAT procedure. See also section 1.4. Fire safety . Are there any First aid Are there any Chemical substances See chapter 4 for regulations regarding the use of chemicals. Any COSHH assessments should be attached.

Manual handling: Description of any activity, such as lifting heavy items or repetitive movements, which could lead to injury and the procedures to control the risks. Lasers and ionizing radiation: See chapter 3 for regulations regarding the use of non-ionizing radiation (for example UV lamps, lasers) or ionizing radiation (for example X-ray equipment, or radioactive sources). Any laser or radiation safety assessments should be attached. Health monitoring: Training: VDU workplaces: References and sources of further information: Any further safety information such as references to other documents. Other risks and safety procedures: Any risks other than the general risks described in the laboratory handbook. Procedures to control risks. Assessment completed by: name, date, signature Approved by head of group: name, date, signature Approved by School Safety Supervisor: name, date, signature Latest date for review of assessment: not later than three years Safety inspection (year 1): name, date, signature Safety inspection (year 2): name, date, signature Safety inspection (year 3): name, date, signature The safety notes are approved by the module leader in consultation with the School Safety Supervisor. Before the start of a module the module leader makes sure that the safety notes are up-to-date. The school safety committee carries out regular safety inspections to make sure the safety notes are correct and up-to-date.

Appendix G

University Safety Policy

The University Safety Policy, Section 4: Guidance on the University Safety Policy with Regard to Individual Responsibility.

G.1 Head of School

As indicated by the General Statement of Safety Policy the Heads of Budget Centres are responsible for ensuring compliance with health and safety matters on a day-to-day basis within their area(s) of control and is therefore responsible to the Council of the University for ensuring compliance with the University's Health and Safety Policy, relevant legislation, approved codes of practice etc. The Head of School retains overall responsibility for health and safety matters and is therefore responsible to the Council of the University for ensuring compliance with the University's Health and Safety Policy, relevant legislation, approved codes of practice etc. The Head of School is responsible for:

1. Fostering a safety culture in which, safety and related issues are seen as essential and integral parts of the centres activity.
2. Ensuring as part of this development of a safety culture the production of a statement of Health and Safety Policy for the School. The statement shall:
 - (a) Contain a general statement of School Health and Safety Policy;
 - (b) Detail the organisation and arrangements in the school for carrying out the school health and safety policy; and the arrangements adopted by the school for monitoring the known hazards, and for ensuring that the risks presented by such hazards do not adversely affect the health and safety of staff, students and others.

Further advice on this topic is available from the University Safety Adviser and the detailed responsibilities of the Head of School are outlined in Annex 4 (see page 40). The Head of School is also responsible for ensuring:-

1. that the health and safety of staff, students, visitors and the general public are not adversely affected by the activities of the school
2. That safe systems of work are used, and where appropriate, written safety rules are prepared and reviewed regularly;
3. That staff and students are trained in safe practices relevant to their work;
4. In academic schools, that an appreciation of appropriate safety aspects of the subject is part of the educational process;
5. that safe machinery and equipment and, where appropriate, any necessary safety appliances or protective equipment are used and checked regularly;
6. That new machinery and equipment is inspected and tested where necessary before initial use;
7. That substances are stored and handled in a safe manner and that information on hazards and safe handling procedures is available;
8. That adequate arrangements exist

for the disposal of stocks of redundant and/or waste materials which cannot be placed in the general refuse system; 9. That buildings where the activities are under the direct control of the school are inspected, and the health and safety arrangements are monitored at regular intervals, and that suitable arrangements are made for the inspection of other sites where significant hazards may exist and which are used by the schools; 10. that all accidents are reported on the University accident report form and that incidents of significance, even where no injury occurs, are suitably investigated; 11. That all assessments required by legislation are performed, monitored and reviewed on a regular basis; 12. that all portable electrical equipment in the school, whether owned by the individual, the school or another organisation (if on loan) is subjected to electrical safety checks at appropriate intervals; 13. that all relevant information on health and safety hazards is provided to all persons including contractors, maintenance staff and visiting researchers, who undertake work in the school; 14. that specialised equipment e.g. autoclaves, lifting tackle, is insured and regularly inspected by the insurers. Advice on whether a particular type of equipment should be insured may be obtained from the Safety Service. Arrangements for insuring equipment are made through the Insurance Section of Registry. 15. that records required by law are maintained and available for inspection, as required, for example, Accident Book and Report Forms; Risk Assessments; Radiation Records, Electrical Equipment Test Records and Staff Safety Training. 16. That matters of general health and safety or radiation protection policy or concerns over resources for these are referred to the Committee for Safety and Radiation Protection Services. [edit]

G.2 School Safety Supervisor

The duties of the School Safety Supervisor are summarised as follows: 1. To advise and assist the Head of School in fulfilling the health and safety responsibilities of the school and in ensuring that guidance in University and School safety policies is adhered to. 2. To disseminate information on health and safety issues within his school or area, where necessary in consultation with the University Safety Adviser. This may relate to information on new regulations or guidance, or to changes of policy or procedure etc. 3. To ensure that new members of the school, including students, are made aware of University safety policy and standards, as well as School safety arrangements and procedures. 4. To monitor that high standard of housekeeping is maintained within their area. 5. To ensure that where appropriate, adequate and suitable protective clothing and equipment is available (and used) within their areas. 6. To provide help and advice to School staff to enable them to meet the requirements of regulations, recognised standards (e.g. BSI) or other accepted standards (e.g. MRC etc.). 7. To organise and conduct relevant School safety inspections (in accordance with any advice given by the University Safety Service) and to maintain records of these inspections and any remedial action. Inspections to be carried out using baseline check list, or variant thereof, produced by Safety Service and remedial action to be prioritised using the risk assessment procedure issued by the Safety Service. 8. To ensure that appropriate safety training is undertaken by School staff. 9. To arrange for the prompt reporting of accidents, in accordance with University procedures. 10. To analyse accident and ill-health statistics to identify unsafe/unhealthy conditions or work practices and consequently to initiate remedial action. 11. To monitor that adequate precautions are taken in relation to any special or new hazard in, or about to be introduced into, the school where appropriate involving the University Safety Adviser. 12. To ensure that first aid boxes

in the school are checked regularly by a suitable member of staff and that any deficiencies are reported and made good; and similarly to ensure that fire extinguishers are inspected on a monthly basis and deficiencies dealt with. 13. To ensure that when any safety equipment is seen to be missing or faulty that prompt action is taken to remedy the fault or deficiency. 14. To liaise with the University Safety Adviser as appropriate. 15. To review periodically health and safety policy, and health and safety procedures within their school/area. 16. In matters of urgency to act with the delegated authority of the Head of school and where appropriate to liaise with University Safety Adviser on these. 17. To refer promptly to the Head of school or University Safety Adviser any health and safety problems, where there is uncertainty as to the standards to apply which cannot be resolved in a timescale appropriate to the risk. Items of general concern can also be referred to the Committee for the Safety and Radiation Protection Services via the Head of school. [edit]

G.3 Radiation Protection Supervisor

The position of the School Radiation Protection Supervisor is summarised as follows:

1. The University, as the employer, is required to appoint one or more employees as Radiation Protection Supervisors under Regulation 11(3) of the Ionising Radiations Regulations 1985, and any such appointments shall be in writing and the names of persons so appointed shall be included in the local rules. In practice, a Head of school where work with ionising radiations is undertaken writes to the Registrar (with a copy to the Radiation Protection Adviser) proposing a member of their academic or academic related staff with a summary of their knowledge and experience of radiation protection, for appointment by the University. The proposal is considered by the Committee for the Safety and Radiation Protection Services and, if supported, a recommendation is passed to Council. The Council then formally appoints, in writing, the person as a Radiation Protection Supervisor. The letter of appointment will refer to the individuals liabilities and to the indemnity by the University of the Individual and their estate.
2. The School Radiation Protection Supervisor is required to supervise the work with ionising radiations in the school to ensure that the requirements of the Regulations are met and also those of the Radioactive Substances Act 1993, the Transport of Radioactive Materials Regulations 1997 and other legislation and guidance relating to protection against ionising radiation.
3. In a school where the level of work with ionising radiations is such that there are areas requiring to be designated as controlled under the Regulations, the School Radiation Protection Supervisor has to be a classified person.
4. The School Radiation Protection Supervisor consults as appropriate with the University Radiation Protection Adviser (Dr IK Haslam), who is appointed under Regulation 10 of the 1985 Regulations.
5. General Regulation 4 of the University requires that no person shall undertake work with ionising radiations except with the approval of the Head of school and that persons undertaking such work shall participate in any scheme of monitoring which the Radiation Protection Adviser may require and must attend such course of instruction as the Head of school may require. In practice, this Regulation is implemented by requiring each prospective user (staff, research workers, research students and undergraduate students working on extended projects as opposed to set experiments) to complete a form which has to be signed by the Head of school and the School Radiation Protection Supervisor before being passed to the Radiation Protection Service for registering and the issue of dosimeters as appropriate. Courses of lectures for radiation workers are given and Notes are issued to persons wishing to

commence radiation work between courses. Training videos may also be borrowed by schools from the Radiation Protection Service. 6. The school Radiation Protection Supervisor prepares the School Local Rules which include the following points, as appropriate to the nature of the work of the school: (a) Ordering sources (b) Receiving sources (c) Accounting for and keeping records of the quantity and location of the sources, including an annual check to ensure that the accounting record is true. (d) Radioactive waste accumulations, disposal and records of disposals and monthly returns to the Radiation Protection Service. (e) Biannual leakage tests on sealed sources (carried out by the Radiation Protection Service). (f) Monitoring surveys and records of dose rates and contamination levels. (g) Control of access to sources and of entry to controlled areas. (h) Personnel monitoring and oversight of the dose records. (i) Systems of work for non-classified persons entering controlled areas. (j) Safety of visitors. (k) Safety of maintenance personnel and contractors and the Permit-to-Work system for their entry in to radiation areas and work on radiation services. (l) Delineation and marking of radiation areas as appropriate. (m) Requirement for prospective radiation workers to register with the Radiation Protection Service and to receive adequate training. (n) Laboratory procedures, especially where unsealed sources are involved. (o) Recalibration of monitoring instruments within every fourteen months (carried out by the Radiation Protection Service). (p) Emergency procedures for accidents and spillages covering as appropriate skin contact; eye contact; ingestion; small spillages; spillages which have to be notified under the Ionising Radiation Regulations 1985; fire. (q) Sensitivities of the various monitoring instruments available. (r) Decontamination procedures. (s) Control of access by cleaning staff.

G.4 Laser Supervisor

The duties of the School Laser Supervisor are summarised below 1. Laser systems should comply with the current British Standard BS EN 60825 and associated Standards as they are developed, the Protection of Eyes Regulations, 1974, Certificate of Approval No. 2 (General) and the Notes of Guidance, Part 2:1 Lasers, 1992, published by the Committee of Vice-Chancellors and Principals. The general requirements of the Provision and Use of Work Equipment Regulations 1992 also apply. 2. General Regulation 4 of the University requires that no person shall undertake work with laser radiation except with the approval of the Head of school and that persons undertaking such work shall participate in any scheme of monitoring which the Radiation Protection Adviser may require and must attend such course of instruction as the Head of school may require. In practice, this Regulation is implemented by requiring each prospective user of lasers in Class 3A or above (staff, research workers, research students and under graduate students working on extended projects as opposed to set experiments) to complete a form which has to be signed by the Head of school and the School Laser Supervisor before being passed to the Radiation Protection Service for registering. Courses of lectures for laser workers are given and Notes are issued to persons wishing to commence laser work between courses. A training video may also be borrowed by schools from the Radiation Protection Service. 3. The duties of the School Laser Supervisor include ensuring that: (a) All lasers except for low power Class 1 lasers are registered with the Radiation Protection Service. (b) Lasers in Class 3B** and Class 4 are operated in Designated Laser Areas and are labelled in accordance with BS EN 60825. (c) Schemes of work are drawn up where necessary for the safe operation of lasers. (These will generally be required when using Class 3B** and Class 4

lasers and the beam paths are not totally enclosed). (d) All personnel intending to work with Class 3A lasers or above are registered for work with lasers with the Radiation Protection Service. (e) All registered laser workers receive copies of the School Local Rules and relevant schemes of work and are informed of the arrangements relating to eye examinations; (f) All registered laser workers receive training in the safe use of lasers. (g) Laser safety goggles are provided for all work with Class 3B** and Class 4 lasers where the laser beam is not totally enclosed; (h) Undergraduates work with the minimum power laser practicable and that they operate under schemes of work. (i) Laser installations are routinely surveyed to monitor that the requirements are being fulfilled. (j) Consultation, as appropriate, with the Radiation Protection Adviser (Dr IK Haslam).

G.5 Fire Wardens

The duties of School Fire Wardens include: 1. Monthly check of the alternative exit routes. 2. Ensure that all staff and post graduate students are familiar with the alternative routes. 3. Check that corridors and staircase enclosures are not used for the storage of combustible materials. 4. Check that fire resistant and self-closing doors are not wedged open or fastened back.

Fire Fighting Equipment: 1. Ensure that all staff, and post graduate students are familiar with the method of operating the fire extinguishers and the hose reels. 2. Ensure that all staff and post graduate students are aware of the dangers of using the wrong extinguishing media on a particular type of fire. 3. Carry out a monthly check of fire fighting equipment.

Fire Drill Procedure: 1. Ensure that staff and post graduate students are aware of the procedures to adopt when a) A fire is discovered b) Hearing the fire alarm 2. On hearing the fire alarm, ensure that the area is evacuated. 3. Assist Security to prevent any persons re-entering. 4. Liaise with the Safety Officers and or Security regarding any local knowledge which may be of assistance to the Fire Authority.

Re-Entry Procedure: 1. At small incidents liaise with Security regarding the re-entry. 2. At prolonged incidents or where contamination is suspected liaise with the Safety Officer, the assistant Safety Officer or in their absence the representative from the Division of Works and Services. 3. If requested to do so assist the Safety Officer or the representative from the Division of Works and Services to carry out any safety tasks prior to the general re-entry.

Evacuation Drills: 1. Where practicable arrange for evacuation drills to be carried out annually. 2. Where a full evacuation drill is impracticable an evacuation exercise should be arranged annually.

General Fire Precautions: 1. Give advice and approval on the use of naked flame and the heating of combustible materials. 2. Ensure that LPG and open element electrical fires are not used. 3. Inform the Safety Service on any change which may effect the means of escape or other fire precautions.

References

- [1] Office Safety Manual University of Leeds, Radiation Protection and Safety Services
- [2] University Radiation and Safety Service web site, which contains a copy of the Office Safety Manual and useful sections on the hazards of Ionising Radiation and Lasers.
- [3] Notes on protection against non-ionising radiation, University Radiation Protection Services handbook
- [4] CVCP document Safety -Universities: Part 2.1 Lasers (1992 Code of Practice)
- [5] BS 7192 -Radiation Safety for Laser Products and BS EN 60825, Laser Safety Officer and EBL
- [6] Health and Safety at Work etc Act 1974, S.I. No. 1974/1439, ISBN 0105-437743.
- [7] Management of Health and Safety at Work etc Regulations 1992, S.I. No. 1992/2051.